DOCUMENT RESUME

ED 334 375 CE 058 390

| | |
|---|---|
| TITLE | Standardized Curriculum for Automotive Mechanics. |
| INSTITUTION | Mississippi State Dept. of Education, Jackson. Office of Vocational, Technical and Adult Education. |
| PUB DATE | Jun 89 |
| NOTE | 62p.; For related documents, see CE 058 387-419. |
| PUB TYPE | Guides - Classroom Use - Teaching Guides (For Teacher) (052) |
| EDRS PRICE | MF01/PC03 Plus Postage. |
| DESCRIPTORS | *Air Conditioning; *Auto Mechanics; Behavioral Objectives; Check Lists; Competency Based Education; *Core Curriculum; *Electrical Systems; *Engines; Equipment; Hand Tools; Heating; Measurement; Motor Vehicles; Safety; Secondary Education; State Curriculum Guides; *State Standards; Student Evaluation; Trade and Industrial Education |
| IDENTIFIERS | Mississippi |

ABSTRACT

Standardized curricula are provided for two courses for the secondary vocational education program in Mississippi: automotive mechanics I and II. The six units in automotive mechanics I are as follows: orientation and safety; tools, equipment, and manuals; measurement; automotive engines; basic electrical systems; and fuel systems. Automotive mechanics II consists of eight units: orientation and safety (review and reinforcement); measurement (review and reinforcement); engine condition evaluation and overhaul; advanced electrical systems; drive train and transmission/transaxle; brakes and bearings; suspension system and front end alignment; and air conditioning and heating. Each unit consists of these components: objectives, with core/essential objectives indicated; suggested instructional practices; list of suggested resources; list of evaluation and suggested minimum performance standards, with core/essential objectives indicated; and performance record, with core/essential objectives indicated. A checklist for each course combining all unit performance standards into a single list is included. (YLB)

**********
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
**********

U.S. DEPARTMENT OF EDUCATION
Office of Educational Research and Improvement
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

☐ Minor changes have been made to improve reproduction quality

• Points of view or opinions stated in this document do not necessarily represent official OERI position or policy

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

BEST COPY AVAILABLE

# STANDARDIZED CURRICULUM

# FOR

# AUTOMOTIVE MECHANICS

MISSISSIPPI DEPARTMENT OF EDUCATION

OFFICE OF VOCATIONAL, TECHNICAL

AND ADULT EDUCATION

June 1989

Direct inquiries to:

Thomas Piazza, Supervisor
Trade and Engineering Technology
Office of Vocational, Technical and Adult Education
P.O. Box 771
Jackson, Mississippi 39205
Phone: (601) 359-3937

Published by the:

Office of Vocational, Technical and Adult Education
Mississippi State Department of Education
Jackson, Mississippi

and

Research and Curriculum Unit for Vocational, Technical and Adult Education
College of Education
Mississippi State University
Mississippi State, Mississippi

1989

The State of Mississippi is an equal opportunity employer and does not discriminate or deny service on the basis of race, color, and national origin, sex, handicap, and/or age.

## FOREWORD

This volume is intended to be used in the State of Mississippi as a mechanism for standardizing vocational education course titles and core contents. The need for standardization of curricula was triggered by provisions in the Educational Reform Act of 1982 which mandated:

-- elimination of nearly all currently existing curriculum requirements and development of new curriculum content that is "properly sequenced" and "coordinated";

-- steps to ensure that students master one level of course work before being advanced to the next level and that progression is properly sequenced;

-- a criterion-referenced, state-wide testing program that is built upon an identified set of "basic skills" keyed to student performance in grades 3, 5, 8, and 11;

-- revised graduation requirements that take into account student performance on the basic skills and also on a test of "functional literacy skills"; and

-- a system of accrediting schools that takes into account the performance of districts, schools, and students.

In addition to the mandates of the Educational Reform Act, the Strategic Plan for Vocational and Technical Education in Mississippi also calls for improving the quality of vocational and technical education through the standardization of curricula and the articulation of secondary and postsecondary programs.

Both of these mandates were further reinforced by legislation passed in 1986 which called for the establishment of state-wide "guidelines and procedures for managing an instructional program in the public schools." This legislation calls for instructional management plans containing the following components:

1. a written list of learning objectives for every course for which academic credit is given on students' transcripts (state specified core objectives must be included);

2. suggested instructional practices and resources for the learning objectives;

3. standards for student performance for each learning objective; and

4. systematic procedures for evaluating student performance on the learning objectives.

Specific local district actions regarding the state-wide instructional management plan are also required, namely:

1. The objectives contained in this document are common to all programs in the state. Core objectives are designated with an asterisk. The local district is encouraged to add additional objectives to this listing to meet local needs of students and employers.

2. The local school board must officially adopt the learning objectives as the district's curricula.

3. Pass/fail policies must be based on mastery of learning objectives.

4. Student performance on the learning objectives must be systematically evaluated at least once during the school year.

5. During the school year, records of individual student performance must indicate whether or not the objectives have been mastered. The record must indicate mastery status for each of the objectives tested in the Basic Skills Assessment Program (including functional literacy skills) and must be permanently maintained on all students who do <u>not</u> master the basic and functional literacy skills prior to being tested on them.

6. Each year, information about student performance on learning objectives must be reviewed. Those objectives which students are not mastering must be identified, and a plan must be developed for improving student performance on those objectives.

TABLE OF CONTENTS

Page

AUTOMOTIVE MECHANICS I..... 1

AUTOMOTIVE MECHANICS II..... 23

STUDENT PERFORMANCE RECORD..... 49

# AUTOMOTIVE MECHANICS I

Developed by

Grover Saxton, Yazoo City Vocational Center
Frank Dungan, Natchez Adams Vocational Center
Richard Echols, West Point Vocational Center
Marvin Floyd, Pascagoula Vocational Center
Waymon Wray, Pontotoc Ridge Vocational Center

Team Leader

Edward L. Thomas, Research and Curriculum Unit

Revised by

Jimmy McCully, Research and Curriculum Unit

## AUTOMOTIVE MECHANICS I

| Unit No. | Title |
|---|---|
| 1 | Orientation and Safety |
| 2 | Tools, Equipment and Manuals |
| 3 | Measurement |
| 4 | Automotive Engines |
| 5 | Basic Electrical Systems |
| 6 | Fuel Systems |

COURSE: Automotive Mechanics I

Unit 1: Orientation and Safety

Objectives: Upon completion of this unit, the student will:

1. Describe facts concerning the occupational outlook of auto mechanics.
2. Name the steps involved in automotive shop work.
3. State reasons for joining the VICA organization.
*4. List rules for personal safety.
*5. List rules for general shop safety.
*6. List safety rules for cold chisels, hammers, pliers, screwdrivers, and vises.
*7. List safety rules involving the engine.
*8. List safety rules involving the battery.
*9. List safety rules involving flammable liquids.
*10. List safety rules for using the bench grinder, lifting devices, and portable electric drive tools.
11. Match fire extinguishers to the classes of fire each is best suited to extinguish.
12. Associate the Federal safety colors with their uses.
*13. Define terms associated with hazardous materials.
*14. Identify categories of hazardous materials.
*15. State signal words or symbols that indicate how severe a hazard may be.
*16. List methods for reducing hazardous waste.
*17. Identify general procedures for storing hazardous materials and wastes.
*18. Identify and describe the informational sections found on a Material Safety Data Sheet.
*19. Describe general first aid procedures to follow in case of an accident involving hazardous materials.
*20. Identify safety equipment to be used with hazardous materials.
*21. List steps to follow in handling spills and waste disposal.
*22. Identify agencies to be contacted in case of an accident or for more information on hazardous materials.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resources: Armstrong, Ivan J. Auto Mechanics, Vol. I. Stillwater, OK: Oklahoma State Board of Vocational and Technical Education. 1976. (Objectives 1-12)

Warzecha, Mary. Hazardous Materials Fingertip Retrieval System. Alexandria, VA: American Vocational Association. 1988. (Objectives 13-22)

Additional Sources: Official Guide for Vocational Industrial Clubs of America (VICA). 1025-15th Street N.W., Washington, D.C. 20005.

Evaluation and Suggested Minimum Performance Standards:

Objective 1: The student will describe two factors concerning the occupational outlook for auto mechanics.
Objective 2: The student will name four steps involved in automotive shop work.
Objective 3: The student will state seven reasons for joining the VICA organization.
*Objective 4: The student will list five rules for personal safety.
*Objective 5: The student will list ten rules for general shop safety.
*Objective 6: The student will list two safety rules concerning the use of each of the following: cold chisels, hammers, pliers, screwdrivers, and vises.
*Objective 7: The student will list three safety rules involving the engine.
*Objective 8: The student will list three safety rules involving batteries.
*Objective 9: The student will list four safety rules regarding flammable liquids.
*Objective 10: The student will list two safety rules regarding the bench grinder, six rules regarding lifting devices, and four rules regarding portable electric drive tools.
Objective 11: The student will match three fire extinguishers to the classes of fire each is best suited to extinguish.
Objective 12: The student will associate the six basic Federal safety colors/patterns to their applications.
*Objective 13: The student will define the following terms associated with hazardous materials: hazardous material, combustible, flammable, corrosive, reactive, E P toxic.
*Objective 14: The student will identify five categories of hazardous materials.
*Objective 15: The student will state in order the five signal words or symbols that indicate how severe a hazard may be.
*Objective 16: The student will list seven methods for reducing hazardous waste.

*Objective 17: The student will identify general procedures for storing hazardous materials and wastes including the following: (a) Make sure that all containers are properly labeled at all times, (b) Mark all containers containing hazardous waste materials with the words "HAZARDOUS WASTE" and with the date that the container was first used to store the waste, (c) Store wastes and materials as described by the manufacturer, (d) Make sure that containers are intact and secure at all times, and (e) Keep all containers closed securely except when being filled or emptied.

*Objective 18: The student will identify and describe nine sections of information found on a Material Safety Data Sheet which provide guidelines for creating a safe work environment.

*Objective 19: The student will describe the following first aid procedures to be followed in case of an accident involving hazarous materials: (a) Move the victim to fresh air, (b) check the container label, material safety data sheet, or other source for first aid procedures and begin first aid at once, (c) contact the person designated to help with first aid and evacuation procedures, (d) call an ambulance, (e) follow instructions from the designated person concerning further first aid and evacuation measures, (f) remain with the person until the ambulance arrives, (g) attach a materials safety data sheet or other information on the material to the person's clothing prior to transport.

*Objective 20: The student will identify seven different pieces of equipment which can be used to protect the body when working with hazardous materials.

*Objective 21: The student will list seven general steps to follow in handling spills and waste disposal.

*Objective 22: The student student will identify three Federal and one State agency which should be contacted in case of an accident or to obtain more information about hazardous materials.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ 1. Described facts concerning the occupational outlook of auto mechanics.
____ 2. Named the steps involved in automotive shop work.
____ 3. Stated reasons for joining the VICA organization.
____ *4. Listed rules for personal safety.
____ *5. Listed rules for general shop safety.
____ *6. Listed safety rules for cold chisels, hammers, pliers, screwdrivers, and vises.

____ *7. Listed safety rules involving the engine.
____ *8. Listed safety rules involving the battery.
____ *9. Listed safety rules involving flammable liquids.
____*10. Listed safety rules for using the bench grinder, lifting devices, and portable electric drive tools.
____ 11. Matched fire extinguishers to the classes of fire each is best suited to extinguish.
____ 12. Associated the Federal safety colors with their uses.
____*13. Defined terms associated with hazardous materials.
____*14. Identified categories of hazardous materials.
____*15. Stated signal words or symbols that indicate how severe a hazard may be.
____*16. Listed methods for reducing hazardous waste.
____*17. Identified general procedures for storing hazardous materials and wastes.
____*18. Identified and described the informational sections found on a Material Safety Data Sheet.
____*19. Described general first aid procedures to follow in case of an accident involving hazardous materials.
____*20. Identified safety equipment to be used with hazardous materials.
____*21. Listed steps to follow in handling spills and waste disposal.
____*22. Identified agencies to be contacted in case of an accident or for more information on hazardous materials.

*Indicates core/essential objectives

COURSE: Automotive Mechanics I

Unit 2: Tools, Equipment and Manuals

Objectives: Upon completion of this unit, the student will:

*1. Identify the different types of the following general-use hand tools: screwdrivers, pliers, wrenches, sockets and accessories, hammers, punches and chisels, and files.
2. Identify different types of parts cleaning tools.
*3. Identify types of general shop tools.
4. Sharpen a twist drill bit.
5. Reshape a cold chisel.
6. Dress a grinding wheel.
7. Fit a screwdriver.
8. Check a torque wrench for accuracy.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Films
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Armstrong, Ivan J. Auto Mechanics, Vol. I. Stillwater, OK: Oklahoma State Board of Vocational and Technical Education. 1976.

Additional Sources: Chilton's, Mitchell's, or Motor's Auto Manuals

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will identify 40 different general-use hand tools.
Objective 2: The student will identify three parts cleaning tools.
*Objective 3: The student will identify seven different general shop tools.
Objective 4: The student will sharpen a twist steel drill bit to its original specifications.
Objective 5: The student will reshape a cold chisel to its original specifications.
Objective 6: The student will redress a grinding wheel so that its sides are square with the edges.
Objective 7: The student will fit a screwdriver to its original specifications.

Objective 8: The student will check a torque wrench to verify that its calibration is accurate.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____*1. Identified the different types of the following general-use hand tools: screwdrivers, pliers, wrenches, sockets and accessories, hammers, punches and chisels, and files.
____ 2. Identified different types of parts cleaning tools.
____*3. Identified types of general shop tools.
____ 4. Sharpened a twist drill bit.
____ 5. Reshaped a cold chisel.
____ 6. Dressed a grinding wheel.
____ 7. Fitted a screwdriver.
____ 8. Checked a torque wrench for accuracy.

*Indicates core/essential objectives

COURSE: Automotive Mechanics I

Unit 3: Measurement

Objectives: Upon completion of this unit, the student will:

1. Identify common types of rules.
2. Describe the uses of rules with accessories.
3. List general procedures for using rules.
4. Identify common units of measurement found on rules.
5. Identify the common types of micrometers.
6. Read a measurement using a pocket rule.
*7. Read a measurement using an outside micrometer.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Armstrong, Ivan J. Auto Mechanics, Vol. I. Stillwater, OK: Oklahoma State Board of Vocational and Technical Education. 1976.

Evaluation and Suggested Minimum Performance Standards:

Objective 1: The student will identify three rules used in shop work.
Objective 2: The student will describe one use of a rule with each of five common accessories.
Objective 3: The student will list five general procedures for using rules.
Objective 4: The student will correctly identify three common units of fractional and two common units of decimal measurement found on rules.
Objective 5: The student will identify outside and inside micrometers.
Objective 6: The student will read a measurement with a pocket rule to the nearest 1/32nd of an inch.
*Objective 7: The student will read a measurement with an outside micrometer to the nearest .001 inch.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ 1. Identified common types of rules.
____ 2. Described the uses of rules with accessories.
____ 3. Listed general procedures for using rules.
____ 4. Identified common units of measurement found on rules.
____ 5. Identified the common types of micrometers.
____ 6. Read a measurement using a pocket rule.
____ *7. Read a measurement using an outside micrometer.

*Indicates core/essential objectives

COURSE: Automotive Mechanics I

Unit 4: Automotive Engines

Objectives: Upon completion of this unit, the student will:

1. Name the types and forms of energy.
*2. Describe the operation of a four-stroke cycle engine.
*3. Identify the common parts of a water-based cooling system and describe their functions.
4. Identify tools used for cooling system service.
*5. Pressure test, inspect, and repair a water-based cooling system.
*6. Identify components of the engine lubrication system and their purposes.
*7. Identify tools used for lubrication service.
8. Identify types of oil filters.
9. Name additives commonly used in engine oil and state their purposes.
10. Describe the classification systems for engine oils.
*11. Change the oil and filter of an engine.
*12. Identify tools used for exhaust system service.
13. Describe the operation and construction of a catalytic converter.
*14. Remove and replace components of the exhaust system.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Armstrong, Ivan J. Auto Mechanics, Vol. I. Stillwater, OK: Oklahoma State Board of Vocational and Technical Education. 1976.

Additional Sources: Stockel, Martin W., and Duffy, James E. Workbook for Auto Mechanic Fundamentals. South Holland, IL: The Goodheart-Wilcox Company. 1982.

Stockel, Martin W., and Stocket, Martin T. Auto Service and Repair. South Holland, IL: The Goodheart-Wilcox Company. 1982.

Evaluation and Suggested Minimum Performance Standards:

Objective 1: The student will name four types of energy and the two forms of energy.

*Objective 2: The student will describe the operation a four-stroke cycle engine in terms of the events which occur during the one cycle.

*Objective 3: The student will identify nine parts of a water-based cooling system and state the purpose of each part.

Objective 4: The student will identify four special tools used in servicing the cooling system.

*Objective 5: The student will pressure test, inspect, and repair a water-based cooling system using established industry procedures.

*Objective 6: The student will identify six components of a four-stroke cycle engine lubrication system and state the purpose of each component.

*Objective 7: The student will identify five special tools used in lubricating automobiles.

Objective 8: The student will identify two types of oil filters.

Objective 9: The student will name six additives commonly used in engine oil and state one purpose of each.

Objective 10: The student will describe two viscosity classifications and four oil service classifications.

*Objective 11: The student will change the oil and filter of an engine following established industry guidelines.

*Objective 12: The student will identify four special tools used in servicing the exhaust system.

Objective 13: The student will list four statements which describe the operation and construction of a catalytic converter.

*Objective 14: The student will remove and replace a muffler and exhaust pipe to manufacturer's specifications.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ 1. Named the types and forms of energy.
____ *2. Described the operation of a four-stroke cycle engine.
____ *3. Identified the common parts of a water-based cooling system and described their functions.
____ 4. Identified tools used for cooling system service.
____ *5. Pressure tested, inspected, and repaired a water-based cooling system.
____ *6. Identified components of the engine lubrication system and their purposes.
____ *7. Identified tools used for lubrication service.
____ 8. Identified types of oil filters.
____ 9. Named additives commonly used in engine oil and stated their purposes.

____ 10. Described the classification systems for engine oils.
____ *11. Changed the oil and filter of an engine.
____ *12. Identified tools used for exhaust system service.
____ 13. Described the operation and construction of a catalytic converter.
____ *14. Removed and replaced components of the exhaust system.

*Indicates core/essential objectives

COURSE: Automotive Mechanics I

Unit 5: Basic Electrical Systems

Objectives: Upon completion of this unit, the student will:

1. Describe electricity according to the electron theory.
*2. Define voltage, amperage, and ohms in relation to current flow.
*3. Demonstrate the ability to use a VOM meter to determine voltage and resistance.
*4. Identify tools used for battery service.
5. State the purpose of the major parts of a battery.
*6. List safety rules to be observed during care and maintenance of batteries.
*7. Remove, clean and service, and replace a battery.
*8. Load test a battery.
*9. Charge test a battery.
*10. Identify tools used for starter service.
*11. Describe the operating principle of a starter.
*12. List the components of a starting system and the purpose of each.
*13. Identify the parts of a starter.
*14. Load test a starter.
*15. Test starter circuit resistance.
*16. Test starter control circuit resistance.
*17. Remove and replace a starter.
*18. Disassemble, check, and reassemble a starter.
*19. Identify tools used for charging system service.
*20. State the purposes of the major components of a charging system.
*21. Identify the parts of an alternator.
22. Describe the construction of a stator.
*23. Describe current and voltage regulation in an alternator.
24. Identify the types of voltage regulators for alternators.
*25. Remove and replace an alternator.
*26. Disassemble, check, and reassemble an alternator.
*27. Test current output of an alternator.
*28. Test external type voltage regulator.
*29. Test internal type voltage regulator.
*30. State the purpose of the ignition system.
*31. Identify tools used for ignition system service.
*32. Identify the major components of an ignition system and state the purpose of each.
*33. Distinguish between components of the primary and secondary ignition systems.
*34. Identify spark plugs according to heat range.
*35. Match causes to spark plug conditions.
*36. Remove, service, and replace spark plugs.
*37. Check and set ignition timing.
*38. Identify common electrical symbols used in chassis wiring diagrams.

*39. Identify instruments used in testing automobile electrical circuits.
*40. List characteristics of a wiring diagram.
*41. Read a wiring diagram.
*42. Troubleshoot an electrical circuit.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Armstrong, Ivan J. Auto Mechanics, Vol. II. Stillwater, OK: Oklahoma State Board of Vocational and Technical Education. 1978.

Evaluation and Suggested Minimum Performance Standards:

Objective 1: The student will describe three factors which affect the flow of electricity according to the electron theory.
*Objective 2: The student will define voltage, current, and resistance in relation to current flow.
*Objective 3: The student will demonstrate the ability to use a volt-ohm meter to determine voltage and resistance in an electrical circuit.
*Objective 4: The student will use identify four special tools used in servicing batteries.
Objective 5: The student will state the purpose of four major parts of a battery.
*Objective 6: The student will list four safety rules to be observed in handling and servicing batteries.
*Objective 7: The student will remove, clean and service, and replace a battery following accepted industry practices.
*Objective 8: The student will load test a battery following accepted industry practices.
*Objective 9: The student will charge test a battery following accepted industry practices.
*Objective 10: The student will identify three special tools used in servicing starters.
*Objective 11: The student will describe the operating principle of a starter.
*Objective 12: The student will list six components of a starting system and the purpose of each.
*Objective 13: The student will identify 10 parts of a starter.
*Objective 14: The student will load test a starter following accepted industry practices.

*Objective 15: The student will test starter circuit resistance following accepted industry practices.

*Objective 16: The student will test starter control circuit resistance following accepted industry practices.

*Objective 17: The student will remove and replace a starter following accepted industry practices.

*Objective 18: The student will disassemble, check for defects and repair as needed, and reassemble a starter following accepted industry practices.

*Objective 19: The student will identify three special tools used in servicing the charging system.

*Objective 20: The student will state the purposes of five major components of a charging system.

*Objective 21: The student will identify five major parts of an alternator.

Objective 22: The student will describe two factors concerning the construction of a stator.

*Objective 23: The student will describe how current and voltage are regulated by a alternator.

Objective 24: The student will identify three types of voltage regulators for alternators.

*Objective 25: The student will remove and replace an alternator following accepted industry procedures.

*Objective 26: The student will disassemble, check and repair, and reassemble an alternator following accepted industry procedures.

*Objective 27: The student will test current output of an alternator to verify that it is operating within manufacturer's specifications.

*Objective 28: The student will test an external type voltage regulator to verify that it is operating within manufacturer's specifications.

*Objective 29: The student will test an internal type voltage regulator to verify that it is operating within manufacturer's specifications.

*Objective 30: The student will state the purpose of the ignition system.

*Objective 31: The student will identify four special tools used in servicing the ignition system.

*Objective 32: The student will identify ten major components of an ignition system and state the purpose of each component.

*Objective 33: The student will distinguish between the components of the primary ignition system and the secondary ignition system.

*Objective 34: The student will identify spark plugs according to the two common heat ranges.

*Objective 35: The student will match six common spark plug conditions to their causes.

*Objective 36: The student will remove, service/replace, and reinstall spark plugs according to established industry practices.

*Objective 37: The student will check and set ignition timing to manufacturer's specifications.
*Objective 38: The student will identify nine symbols commonly used on automotive electrical wiring diagrams.
*Objective 39: The student will identify four instruments used in testing automobile circuits.
*Objective 40: The student will list four characteristics of automotive wiring diagrams.
*Objective 41: The student will read a wiring diagram by indicating the color and gauge of wire illustrated in the diagram at five specific points indicated by the instructor.
*Objective 42: The student will troubleshoot an electrical circuit, locate the cause of the problem, and correct it.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ 1. Described electricity according to the electron theory.
____ *2. Defined voltage, amperage, and ohms in relation to current flow.
____ *3. Demonstrated the ability to use a VOM meter to determine voltage and resistance.
____ *4. Identified tools used in battery service.
____ 5. Stated the purpose of the major parts of a battery.
____ *6. Listed safety rules to be observed during care and maintenance of batteries.
____ *7. Removed, cleaned and serviced, and replaced a battery.
____ *8. Load tested a battery.
____ *9. Charge tested a battery.
____ *10. Identified tools used for starter service.
____ *11. Described the operating principle of a starter.
____ *12. Listed the components of a starting system and the purpose of each.
____ *13. Identified the parts of a starter.
____ *14. Load tested a starter.
____ *15. Tested starter circuit resistance.
____ *16. Tested starter control circuit resistance.
____ *17. Removed and replaced a starter.
____ *18. Disassembled, checked, and reassembled a starter.
____ *19. Identified tools used for charging system service.
____ *20. Stated the purposes of the major components of a charging system.
____ *21. Identified the parts of an alternator.
____ 22. Described the construction of a stator.
____ *23. Described current and voltage regulation in an alternator.
____ 24. Identified the types of voltage regulators for alternators.
____ *25. Removed and replaced an alternator.
____ *26. Disassembled, checked, and reassembled an alternator.
____ *27. Tested current output of an alternator.

____*28. Tested external type voltage regulator.
____*29. Tested internal type voltage regulator.
____*30. Stated the purpose of the ignition system.
____*31. Identified tools used for ignition system service.
____*32. Identified the major components of an ignition system and stated the purpose of each.
____*33. Distinguished between components of the primary and secondary ignition systems.
____*34. Identified spark plugs according to heat range.
____*35. Matched causes to spark plug conditions.
____*36. Removed, serviced, and replaced sparkplugs.
____*37. Checked and set ignition timing.
____*38. Identified common electrical symbols used in chassis wiring diagrams.
____*39. Identified instruments used in testing automobile electrical circuits.
____*40. Listed characteristics of a wiring diagram.
____*41. Read a wiring diagram.
____*42. Troubleshot an electrical circuit.

*Indicates core/essential objectives

COURSE: Automotive Mechanics I

Unit 6: Fuel Systems

Objectives: Upon completion of this unit, the student will:

*1. Identify tools used for fuel system service.
*2. List the purpose of each component of a typical carburetor-type gasoline fuel system.
3. Describe the operation of a mechanical fuel pump.
*4. Identify parts of a carburetor.
*5. State the difference in a fuel injection system and a carburetor-type system.
*6. Test a fuel pump for volume and pressure.
*7. Remove and replace a fuel pump.
*8. Service an air cleaner.
*9. Remove and replace a carburetor.
*10. Disassemble and replace a carburetor.
*11. Describe the areas of automotive emission controls.
12. Name the major classes of emission pollutants.
*13. State three possible causes of the emission of unburned hydrocarbons.
14. State the major cause of carbon monoxide emissions.
15. State three factors that can affect the emission of $NO_x$.
16. State the purpose of the heated air induction system.
17. State the purpose of the evaporative emissions control system.
18. State the purpose of the exhaust crossover system.
*19. State the purpose of the exhaust gas recirculation system.
*20. State the purpose of the positive crankcase ventilation system.
21. State the purpose of the air injection system.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resources: Armstrong, Ivan J. Auto Mechanics, Vol. I. Stillwater, OK: Oklahoma State Board of Vocational and Technical Education. 1976.

Lee, Billy S., and Ragazzi, Ronald. Automotive Emission Control. Stillwater,OK: Mid-America Vocational Curriculum Consortium, Inc. 1979.

Additional Sources: Stockel, Martin W., and Duffy, James E. Auto Mechanics Fundamentals. South Holland, IL: The Goodheart-Wilcox Company. 1982.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will identify two special tools used in servicing the fuel system.

*Objective 2: The student will list the purpose of each of the six major components of a typical carburetor-type fuel system.

Objective 3: The student will describe the operation of a mechanical fuel pump during the inlet and outlet strokes.

*Objective 4: The student will identify seven different parts of a carburetor.

*Objective 5: The student will describe the major difference in a fuel injection system as compared to a carburetor-type system.

*Objective 6: The student will test a fuel pump to verify that volume and pressure output of the pump are within manufacturer's specifications.

*Objective 7: The student will remove and replace a fuel pump following industry approved procedures.

*Objective 8: The student will service an air cleaner following industry approved procedures.

*Objective 9: The student will remove and replace a carburetor following industry approved procedures.

*Objective 10: The student will disassemble and reassemble a carburetor following industry approved procedures.

*Objective 11: The student will describe the three areas of automotive emission control.

Objective 12: The student will name the three major classes of emission pollutants.

*Objective 13: The student will state three possible causes of the emission of unburned hydrocarbons.

Objective 14: The student will state the major cause of carbon monoxide emissions.

Objective 15: The student will state three factors that can affect the emission of $NO_x$.

Objective 16: The student will state the purpose of the heated air induction system.

Objective 17: The student will state the purpose of the evaporative emissions control system.

Objective 18: The student will state the purpose of the exhaust crossover system.

*Objective 19: The student will state the purpose of the exhaust gas recirculation system.

*Objective 20: The student will state the purpose of the positive crankcase ventilation system.

Objective 21: The student will state the purpose of the air injection system.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Identified tools used for fuel system service.
____ *2. Listed the purpose of each component of a typical carburetor-type gasoline fuel system.
____ 3. Described the operation of a mechanical fuel pump.
____ *4. Identified parts of a carburetor.
____ *5. Stated the difference in a fuel injection system and a carburetor-type system.
____ *6. Tested a fuel pump for volume and pressure.
____ *7. Removed and replaced a fuel pump.
____ *8. Serviced an air cleaner.
____ *9. Removed and replaced a carburetor.
____ *10. Disassembled and replaced a carburetor.
____ *11. Described the areas of automotive emission controls.
____ 12. Named the major classes of emission pollutants.
____ *13. Stated three possible causes of the emission of unburned hydrocarbons.
____ 14. Stated the major cause of carbon monoxide emissions.
____ 15. Stated three factors that can affect the emission of $NO_x$.
____ 16. Stated the purpose of the heated air induction system.
____ 17. Stated the purpose of the evaporative emissions control system.
____ 18. Stated the purpose of the exhaust crossover system.
____ *19. Stated the purpose of the exhaust gas recirculation system.
____ *20. Stated the purpose of the positive crankcase ventilation system.
____ 21. Stated the purpose of the air injection system.

*Indicates core/essential objectives

# AUTOMOTIVE MECHANICS II

Developed by

Grover Saxton, Yazoo City Vocational Center
Frank Dungan, Natchez Adams Vocational Center
Richard Echols, West Point Vocational Center
Marvin Floyd, Pascagoula Vocational Center
Waymon Wray, Pontotoc Ridge Vocational Center

Team Leader

Edward L. Thomas, Research and Curriculum Unit

Revised by

Jimmy McCully, Research and Curriculum Unit

AUTOMOTIVE MECHANICS II

| Unit No. | Title |
|---|---|
| 1 | Orientation and Safety (Review and Reinforcement) |
| 2 | Measurement (Review and Reinforcement) |
| 3 | Engine Condition Evaluation and Overhaul |
| 4 | Advanced Electrical Systems |
| 5 | Drive Train and Transmission/Transaxle |
| 6 | Brakes and Bearings |
| 7 | Suspension System and Front End Alignment |
| 8 | Air Conditioning and Heating |

COURSE: Automotive Mechanics II

Unit 1: Orientation and Safety (Review and Reinforcement)

Objectives: Upon completion of this unit, the student will:

1. Describe facts concerning the occupational outlook of auto mechanics.
2. Name the steps involved in automotive shop work.
3. State reasons for joining the VICA organization.
*4. List rules for personal safety.
*5. List rules for general shop safety.
*6. List safety rules for cold chisels, hammers, pliers, screwdrivers, and vises.
*7. List safety rules involving the engine.
*8. List safety rules involving the battery.
*9. List safety rules involving flammable liquids.
*10. List safety rules for using the bench grinder, lifting devices, and portable electric drive tools.
11. Match fire extinguishers to the classes of fire each is best suited to extinguish.
12. Associate the Federal safety colors with their uses.
*13. Define terms associated with hazardous materials.
*14. Identify categories of hazardous materials.
*15. State signal words or symbols that indicate how severe a hazard may be.
*16. List methods for reducing hazardous waste.
*17. Identify general procedures for storing hazardous materials and wastes.
*18. Identify and describe the informational sections found on a Material Safety Data Sheet.
*19. Describe general first aid procedures to follow in case of an accident involving hazardous materials.
*20. Identify safety equipment to be used with hazardous materials.
*21. List steps to follow in handling spills and waste disposal.
*22. Identify agencies to be contacted in case of an accident or for more information on hazardous materials.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resources: Armstrong, Ivan J. Auto Mechanics, Vol. I. Stillwater, OK: Oklahoma State Board of Vocational and Technical Education. 1976. (Objectives 1-12)

Warzecha, Mary. Hazardous Materials Fingertip Retrieval System. Alexandria, VA: American Vocational Association. 1988. (Objectives 13-22)

Additional Sources: Official Guide for Vocational Industrial Clubs of America (VICA). 1025-15th Street N.W., Washington, D.C. 20005.

Evaluation and Suggested Minimum Performance Standards:

Objective 1: The student will describe two factors concerning the occupational outlook for auto mechanics.
Objective 2: The student will name four steps involved in automotive shop work.
Objective 3: The student will state seven reasons for joining the VICA organization.
*Objective 4: The student will list five rules for personal safety.
*Objective 5: The student will list ten rules for general shop safety.
*Objective 6: The student will list two safety rules concerning the use of each of the following: cold chisels, hammers, pliers, screwdrivers, and vises.
*Objective 7: The student will list three safety rules involving the engine.
*Objective 8: The student will list three safety rules involving batteries.
*Objective 9: The student will list four safety rules regarding flammable liquids.
*Objective 10: The student will list two safety rules regarding the bench grinder, six rules regarding lifting devices, and four rules regarding portable electric drive tools.
Objective 11: The student will match three fire extinguishers to the classes of fire each is best suited to extinguish.
Objective 12: The student will associate the six basic Federal safety colors/patterns to their applications.
*Objective 13: The student will define the following terms associated with hazardous materials: hazardous material, combustible, flammable, corrosive, reactive, E P toxic.
*Objective 14: The student will identify five categories of hazardous materials.
*Objective 15: The student will state in order the five signal words or symbols that indicate how severe a hazard may be.
*Objective 16: The student will list seven methods for reducing hazardous waste.

*Objective 17: The student will identify general procedures for storing hazardous materials and wastes including the following: (a) Make sure that all containers are properly labeled at all times, (b) Mark all containers containing hazardous waste materials with the words "HAZARDOUS WASTE" and with the date that the container was first used to store the waste, (c) Store wastes and materials as described by the manufacturer, (d) Make sure that containers are intact and secure at all times, and (e) Keep all containers closed securely except when being filled or emptied.

*Objective 18: The student will identify and describe nine sections of information found on a Materials Safety Data Sheet which provide guidelines for creating a safe work environment.

*Objective 19: The student will describe the following first aid procedures to be followed in case of an accident involving hazarous materials: (a) Move the victim to fresh air, (b) check the container label, material safety data sheet, or other source for first aid procedures and begin first aid at once, (c) contact the person designated to help with first aid and evacuation procedures, (d) call an ambulance, (e) follow instructions from the designated person concerning further first aid and evacuation measures, (f) remain with the person until the ambulance arrives, (g) attach a materials safety data sheet or other information on the material to the person's clothing prior to transport.

*Objective 20: The student will identify seven different pieces of equipment which can be used to protect the body when working with hazardous materials.

*Objective 21: The student will list seven general steps to follow in handling spills and waste disposal.

*Objective 22: The student student will identify three Federal and one State agency which should be contacted in case of an accident or to obtain more information about hazardous materials.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ 1. Described facts concerning the occupational outlook of auto mechanics.
____ 2. Named the steps involved in automotive shop work.
____ 3. Stated reasons for joining the VICA organization.
____ *4. Listed rules for personal safety.
____ *5. Listed rules for general shop safety.
____ *6. Listed safety rules for cold chisels, hammers, pliers, screwdrivers, and vises.

____ *7. Listed safety rules involving the engine.
____ *8. Listed safety rules involving the battery.
____ *9. Listed safety rules involving flammable liquids.
____*10. Listed safety rules for using the bench grinder, lifting devices, and portable electric drive tools.
____ 11. Matched fire extinguishers to the classes of fire each is best suited to extinguish.
____ 12. Associated the Federal safety colors with their uses.
____*13. Defined terms associated with hazardous materials.
____*14. Identified categories of hazardous materials.
____*15. Stated signal words or symbols that indicate how severe a hazard may be.
____*16. Listed methods for reducing hazardous waste.
____*17. Identified general procedures for storing hazardous materials and wastes.
____*18. Identified and described the informational sections found on a Material Safety Data Sheet.
____*19. Described general first aid procedures to follow in case of an accident involving hazardous materials.
____*20. Identified safety equipment to be used with hazardous materials.
____*21. Listed steps to follow in handling spills and waste disposal.
____*22. Identified agencies to be contacted in case of an accident or for more information on hazardous materials.

*Indicates core/essential objectives

COURSE: Automotive Mechanics II

Unit 2: Measurement (Review and Reinforcement)

Objectives: Upon completion of this unit, the student will:

1. Identify common types of rules.
2. Describe the uses of rules with accessories.
3. List general procedures for using rules.
4. Identify common units of measurement found on rules.
5. Identify the common types of micrometers.
6. Read a measurement using a pocket rule.
*7. Read a measurement using an outside micrometer.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Armstrong, Ivan J. Auto Mechanics, Vol. I. Stillwater, OK: Oklahoma State Board of Vocational and Technical Education. 1976.

Evaluation and Suggested Minimum Performance Standards:

Objective 1: The student will identify three rules used in shop work.
Objective 2: The student will describe one use of a rule with each of five common accessories.
Objective 3: The student will list five general procedures for using rules.
Objective 4: The student will correctly identify three common units of fractional and two common units of decimal measurement found on rules.
Objective 5: The student will identify outside and inside micrometers.
Objective 6: The student will read a measurement with a pocket rule to the nearest 1/32nd of an inch.
*Objective 7: The student will read a measurement with an outside micrometer to the nearest .001 inch.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

___ 1. Identified common types of rules.
___ 2. Described the uses of rules with accessories.

____ 3. Listed general procedures for using rules.
____ 4. Identified common units of measurement found on rules.
____ 5. Identified the common types of micrometers.
____ 6. Read a measurement using a pocket rule.
____ *7. Read a measurement using an outside micrometer.

*Indicates core/essential objectives

COURSE: Auto Mechanics II

Unit 3: Engine Condition Evaluation and Overhaul

Objectives: Upon completion of this unit, the student will:

*1. Identify tools used in engine repair.
*2. Identify conditions that cause low oil pressure in engines.
*3. Identify conditions that cause oil consumption in engines.
*4. Name items to check prior to testing for internal engine noise.
*5. Test engine compression.
*6. List safety precautions to observe while removing an engine.
*7. Remove an engine.
*8. List safety precautions to observe while disassembling an engine.
*9. Clean and disassemble an engine.
*10. State the purpose of a valve train.
*11. Identify the parts of a valve train.
*12. Inspect timing gears and timing chain.
*13. Inspect camshaft.
*14. Disassemble, clean, and inspect a cylinder head assembly.
*15. Recondition a cylinder head.
*16. Identify the parts of a crankshaft.
*17. Distinguish between bearing spread and bearing crush.
*18. Distinguish between the purpose of the torsional vibration damper and flywheel.
*19. List conditions which cause low oil pressure.
*20. Measure and inspect a crankshaft.
*21. Fit a crankshaft bearing with plastigage.
*22. Install a rear main bearing seal (crankshaft removed).
*23. Name types of cylinder block core plug holes.
*24. Identify parts of piston and connecting rod assembly.
*25. Associate compression rings with their proper method of installation.
*26. List methods for installing oil rings.
*27. Match piston conditions to their correct causes.
28. Identify different types of piston pin locks.
*29. Remove piston ridge from cylinder.
*30. Measure a cylinder.
*31. Hone a cylinder.
*32. Clean a cylinder head surface and check for warpage.
*33. List reasons for torquing bolts to specifications.
*34. Install crankshaft, bearings, timing gears, and timing cover.
*35. Install pistons and connecting rod assemblies.
*36. Install oil pump, pickup screen, and oil pan.
*37. Install cylinder head, intake manifold, and exhaust manifold.
*38. Install engine accessory components.
*39. List safety precautions to observe when installing an engine.
*40. List items to check or adjust before starting a new or rebuilt engine.

*41. Install an engine.
*42. Adjust and start a newly installed engine.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Armstrong, Ivan J. Auto Mechanics, Vol. II. Stillwater, OK: Oklahoma State Board of Vocational and Technical Education. 1978.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will identify six special tools used in engine repair and rebuilding.
*Objective 2: The student will identify six conditions that cause low oil pressure.
*Objective 3: The student will identify five conditions that cause oil consumption.
*Objective 4: The student will name four items to check prior to testing for internal engine noise.
*Objective 5: The student will perform dry compression tests and wet compression tests and compare results.
*Objective 6: The student will list six safety precautions to observe while removing an engine.
*Objective 7: The student will remove an engine following industry recommended practices and procedures.
*Objective 8: The student will list three safety precautions to be observed while disassembling an engine.
*Objective 9: The student will clean and disassemble an engine following industry recommended practices and procedures.
*Objective 10: The student will state the purpose of the valve train.
*Objective 11: The student will identify the eight major parts of a valve train.
*Objective 12: The student will inspect the timing gears and the timing chain to verify if they are within manufacturer's specifications.
*Objective 13: The student will inspect the camshaft to verify if it is within manufacturer's specifications.
*Objective 14: The student will disassemble, clean, and inspect a cylinder head assembly to verify that all parts are within the manufacturer's specifications.
*Objective 15: The student will recondition a cylinder head to meet manufacturer's specifications.
*Objective 16: The student will identify eight parts of a crankshaft.

*Objective 17: The student will distinguish between bearing spread and bearing crush.
*Objective 18: The student will distinguish between the purpose of the torsional vibration damper and the flywheel.
*Objective 19: The student will list six conditions that could possibly cause low oil pressure.
*Objective 20: The student will measure and inspect a crankshaft and verify that it is or is not within manufacturer's specifications.
*Objective 21: The student will fit a crankshaft with plastigage.
*Objective 22: The student will install a rear main bearing seal to the manufacturer's specifications with the crankshaft removed.
*Objective 23: The student will name two types of cylinder block core holes.
*Objective 24: The student will identify eleven parts of the piston and connecting rod assembly.
*Objective 25: The student will associate four different types of compression rings with their proper method of installation.
*Objective 26: The student will list the method for installing two types of oil rings.
*Objective 27: The student will match six piston conditions to their related causes.
Objective 28: The student will identify three types of piston pin locks.
*Objective 29: The student will remove a piston ridge from a cylinder to allow the piston to be removed.
*Objective 30: The student will measure a cylinder to verify that taper, wear, and out-of-round are within manufacturer's specifications.
*Objective 31: The student will hone a cylinder to remove any glazed surface present.
*Objective 32: The student will clean a cylinder head surface and check to see if warpage exceeds manufacturer's specifications.
*Objective 33: The student will list three reasons for torquing bolts to the manufacturer's specifications.
*Objective 34: The student will install crankshaft, bearings, timing gears, and timing cover following industry practices and manufacturer's specifications.
*Objective 35: The student will install pistons and connecting rod assemblies following industry practices and to manufacturer's specifications.
*Objective 36: The student will install an oil pump, pickup screen, and oil pan to manufacturer's specifications.
*Objective 37: The student will install a cylinder head and intake and exhaust manifolds to manufacturer's specifications.
*Objective 38: The student will install engine accessories including a fuel pump, water pump, and ignition accessories.

*Objective 39: The student will list four safety precautions to be observed in installing an engine.
*Objective 40: The student will list four factors to check or adjust before starting a new or rebuilt engine.
*Objective 41: The student will install an engine using industry procedures and following manufacturer's specifications.
*Objective 42: The student will adjust and start a new or rebuilt engine.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Identified tools used in engine repair.
____ *2. Identified conditions that cause low oil pressure in engines.
____ *3. Identified conditions that cause oil consumption in engines.
____ *4. Named items to check prior to testing for internal engine noise.
____ *5. Tested engine compression.
____ *6. Listed safety precautions to observe while removing an engine.
____ *7. Removed an engine.
____ *8. Listed safety precautions to observe while disassembling an engine.
____ *9. Cleaned and disassembled an engine.
____*10. Stated the purpose of a valve train.
____*11. Identified the parts of a valve train.
____*12. Inspected timing gears and timing chain.
____*13. Inspected camshaft.
____*14. Disassembled, cleaned, and inspected a cylinder head assembly.
____*15. Reconditioned a cylinder head.
____*16. Identified the parts of a crankshaft.
____*17. Distinguished between bearing spread and bearing crush.
____*18. Distinguished between the purpose of the torsional vibration damper and flywheel.
____*19. Listed conditions which cause low oil pressure.
____*20. Measured and inspected a crankshaft.
____*21. Fitted a crankshaft bearing with plastigage.
____*22. Installed a rear main bearing seal (crankshaft removed).
____*23. Named types of cylinder block core plug holes.
____*24. Identified parts of piston and connecting rod assembly.
____*25. Associated compression rings with their proper method of installation.
____*26. Listed methods for installing oil rings.
____*27. Matched piston conditions to their correct causes.
____ 28. Identified different types of piston pin locks.
____*29. Removed piston ridge from cylinder.
____*30. Measured a cylinder.
____*31. Honed a cylinder.

____*32. Cleaned a cylinder head surface and checked for warpage.
____*33. Listed reasons for torquing bolts to specifications.
____*34. Installed crankshaft, bearings, timing gears, and timing cover.
____*35. Installed pistons and connecting rod assemblies.
____*36. Installed oil pump, pickup screen, and oil pan.
____*37. Installed cylinder head, intake manifold, and exhaust manifold.
____*38. Installed engine accessory components.
____*39. Listed safety precautions to observe when installing an engine.
____*40. Listed items to check or adjust before starting a new or rebuilt engine.
____*41. Installed an engine.
____*42. Adjusted and started a newly installed engine.

*Indicates core/essential objectives

COURSE: Automotive Mechanics II

Unit 4: Advanced Electrical Systems

Objectives: Upon completion of this unit, the student will:

*1. Discuss the relationship of a conventional ignition to an electronic ignition system.
*2. List advantages of the electronic ignition system.
*3. Identify the major components of an electronic ignition system.
*4. State the function of each of the major components of an electronic ignition system.
*5. List components of an electronically controlled engine system and state one function of each component.
*6. List processes performed by the processor unit of an electronic control module.
*7. List processes performed by the calibration unit of an electronic control module.
*8. Describe the operation of an electronically controlled engine system.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resources: Armstrong, Ivan J. Auto Mechanics, Vol. II. Stillwater, OK: Oklahoma State Board of Vocational and Technical Education. 1978. (Objectives 1-4)

Lee, Billy D., and Ragazzi, Ronald. Automotive Emission Control. Stillwater, OK: Mid-America Vocational Curriculum Consortium. 1979. (Objectives 5-9)

Additional Resources: Crouse, William H. and Anglin, Donald L. Automotive Mechanics (9th edition). McGraw-Hill, Inc. 1985.

King, Dick. Computerized Engine Controls. Albany, NY: Delmar Publishers. 1987.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will describe one main difference in a conventional ignition system and an electronic ignition system.
*Objective 2: The student will list three advantages of an electronic ignition system.
*Objective 3: The student will identify three major components of an electronic ignition system.
*Objective 4: The student will state the function of three of the major components of the electronic ignition system.
*Objective 5: The student will list six components of an electronically controlled engine system and state one function of each component.
*Objective 6: The student will list four processes performed by the sensor processor unit of the electronic control module.
*Objective 7: The student will list one process performed by the calibration unit of an electronic control module.
*Objective 8: The student will describe the operation of an electronically controlled engine system in terms of input, processing, and results.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____*1. Discussed the relationship of a conventional ignition to an electronic ignition system.
____*2. Listed advantages of the electronic ignition system.
____*3. Identified the major components of an electronic ignition system.
____*4. Stated the function of each of the major components of an electronic ignition system.
____*5. Listed components of an electronically controlled engine system and stated one function of each component.
____*6. Listed processes performed by the processor unit of an electronic control module.
____*7. Listed processes performed by the calibration unit of an electronic control module.
____*8. Described the operation of an electronically controlled engine system.

*Indicates core/essential objectives

COURSE: Automotive Mechanics II

Unit 5: Drive Train and Transmission/Transaxle

Objectives: Upon completion of this unit, the student will:

*1. Identify tools used in drive line repair.
*2. Identify the components of a clutch assembly.
*3. Discuss clutch operation.
*4. Adjust clutch linkage free travel.
*5. Identify the major parts of a transmission.
6. Identify the parts of a synchronizer.
*7. Discuss the operation of a three-speed synchromesh transmission.
8. Identify the components of an electronically operated overdrive.
*9. Remove and replace a standard transmission and clutch assembly.
*10. Identify the types of drive lines.
11. Identify the types of U-joints.
*12. Remove and replace a propeller shaft.
*13. Remove and replace a U-joint.
14. List repairs which can be performed on an automatic transmission with the transmission in the vehicle.
*15. List the steps in checking automatic transmission fluid.
*16. Match automatic transmission fluid conditions to their possible causes.
*17. Tune up an automatic transmission.
*18. Remove and replace an automatic transmission.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Armstrong, Ivan J. Auto Mechanics, Vol. II. Stillwater, OK: Oklahoma State Board of Vocational and Technical Education. 1978.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will identify six special tools used in drive line repair.
*Objective 2: The student will identify four components of a clutch assembly.
*Objective 3: The student will discuss clutch operation as related to events when the clutch is engaged and disengaged.
*Objective 4: The student will adjust clutch linkage free travel to within the manufacturer's specifications.

*Objective 5: The student will identify ten parts of a standard transmission.
Objective 6: The student will identify three parts of a synchronizer.
*Objective 7: The student will discuss the operation of a three-speed synchromesh transmission in terms of the operation of each gear in the transmission.
Objective 8: The student will identify three major parts of an electronically operated overdrive.
*Objective 9: The student will remove and replace a standard transmission and clutch assembly.
*Objective 10: The student will identify the two types of drive lines.
Objective 11: The student will identify three types of U-joints.
*Objective 12: The student will remove and replace a propeller shaft following industry practices and manufacturer's specifications.
*Objective 13: The student will remove and replace a U-joint following industry practices and manufacturer's specifications.
Objective 14: The student will list five repairs which can be performed on an automatic transmission with the transmission still in the vehicle.
*Objective 15: The student will list in order the six steps involved in checking automatic transmission fluid levels.
*Objective 16: The student will match three automatic transmission fluid conditions to their possible causes.
*Objective 17: The student will tune up an automatic transmission following manufacturer's procedures and specifications.
*Objective 18: The student will remove and reinstall an automatic transmission following manufacturer's procedures and specifications.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Identified tools used in drive line repair.
____ *2. Identified the components of a clutch assembly.
____ *3. Discussed clutch operation.
____ *4. Adjusted clutch linkage free travel.
____ *5. Identified the major parts of a transmission.
____ 6. Identified the parts of a synchronizer.
____ *7. Discussed the operation of a three-speed synchromesh transmission.
____ 8. Identified the components of an electronically operated overdrive.
____ *9. Removed and replaced a standard transmission and clutch assembly.
____*10. Identified the types of drive lines.
____ 11. Identified the types of U-joints.
____*12. Removed and replaced a propeller shaft.
____*13. Removed and replaced a U-joint.

____ 14. Listed repairs which can be performed on an automatic transmission with the transmission in the vehicle.
____*15. Listed the steps in checking automatic transmission fluid.
____*16. Matched automatic transmission fluid conditions to their possible causes.
____*17. Tuned up an automatic transmission.
____*18. Removed and replaced an automatic transmission.

*Indicates core/essential objectives

COURSE: Automotive Mechanics II

Unit 6: Brakes and Bearings

Objectives: Upon completion of this unit, the student will:

*1. Identify tools used for brake system service.
*2. Identify components of the tandem or dual brake system.
*3. Describe the operation of the brake system.
*4. Adjust brake shoes.
*5. Bleed a brake system.
*6. Remove, inspect, and replace brake drums.
*7. Remove and replace brake shoes.
*8. Remove and replace a wheel cylinder.
*9. Remove and replace a tandem master cylinder.
*10. State the functions of major components of disc brake systems.
*11. Test hydraulic systems.
*12. Test vacuum power booster.
*13. Repair a sliding caliper disc brake.
*14. Check disc runout and thickness.
*15. Turn rotor.
*16. Clean and inspect a bearing.
*17. Adjust front wheel bearings.
*18. Pack a front wheel bearing assembly.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Armstrong, Ivan J. Auto Mechanics, Vol. I. Stillwater, OK: Oklahoma State Board of Vocational and Technical Education. 1976.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will identify five special tools used in brake service.
*Objective 2: The student will identify six components of a tandem or dual brake system.
*Objective 3: The student will describe the operation of the brake system in terms of the events which happen when the brake pedal is depressed and then released.
*Objective 4: The student will adjust brake shoes to manufacturer's specifications.

*Objective 5: The student will bleed a brake system following industry approved procedures.
*Objective 6: The student will remove, inspect and service if needed, and replace brake drums.
*Objective 7: The student will remove and replace brake shoes following industry approved procedures.
*Objective 8: The student will remove, recondition, and replace a wheel cylinder.
*Objective 9: The student will remove and replace a tandem master cylinder.
*Objective 10: The student will state the functions of five major components of a disc brake system.
*Objective 11: The student will test the hydraulic system of a power brake following industry accepted procedures.
*Objective 12: The student will test the vacuum power booster unit and verify that it is operating within manufacturer's specifications.
*Objective 13: The student will repair a sliding caliper disc brake to manufacturer's specifications.
*Objective 14: The student will check disc runout and thickness to verify that these measurements are within manufacturer's specifications.
*Objective 15: The student will turn a rotor to restore its surface to manufacturer's specifications.
*Objective 16: The student will clean and inspect a bearing following industry accepted procedures.
*Objective 17: The student will adjust front wheel bearings to manufacturer's specifications.
*Objective 18: The student will pack a front wheel bearing assembly following industry accepted procedures and manufacturer's specifications.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Identified tools used in brake system service.
____ *2. Identified components of the tandem or dual brake system.
____ *3. Described the operation of the brake system.
____ *4. Adjusted brake shoes.
____ *5. Bled a brake system.
____ *6. Removed, inspected, and replaced brake drums.
____ *7. Removed and replaced brake shoes.
____ *8. Removed and replaced a wheel cylinder.
____ *9. Removed and replaced a tandem master cylinder.
____ *10. Stated the functions of major components of disc brake systems.
____ *11. Tested hydraulic systems.
____ *12. Tested vacuum power booster.
____ *13. Repaired a sliding caliper disc brake.

____*14. Checked disc runout and thickness.
____*15. Turned a rotor.
____*16. Cleaned and inspected a bearing.
____*17. Adjusted front wheel bearings.
____*18. Packed a front wheel bearing assembly.

*Indicates core/essential objectives

COURSE: Automotive Mechanics II

Unit 7: Suspension System and Front End Alignment

Objectives: Upon completion of this unit, the student will:

*1. Identify tools used for front end service.
2. Match correct load range for tires to ply ratings.
*3. Give reasons for periodic tire rotation.
4. Draw tire rotation patterns.
*5. State conditions which would require rebalancing of wheels.
*6. Check tires and wheel runout.
*7. Spin balance a tire and wheel assembly.
*8. Inspect and replace shock absorbers.
*9. Inspect a front suspension for wear.
*10. Inspect a steering system for damaged parts or wear.
*11. Remove and replace a tie rod end.
*12. Remove, service, and replace a power steering pump.
*13. Make preliminary checks before wheel alignment.
14. Align a front end on a vehicle without a front cap.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Armstrong, Ivan J. Auto Mechanics, Vol. I. Stillwater, OK: Oklahoma State Board of Vocational and Technical Education. 1976.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will identify four special tools used in front end service.
Objective 2: The student will match the three load range ratings to the tire ply ratings.
*Objective 3: The student will list two reasons for periodic tire rotation.
Objective 4: The student will draw tire rotation patterns for bias ply and radial ply tires.
*Objective 5: The student will identify four conditions which would require rebalancing of wheels.
*Objective 6: The student will check tires and wheel runout to verify that they are within industry standards.
*Objective 7: The student will spin balance a tire and wheel assembly to industry standards.

*Objective 8: The student will inspect and replace shock absorbers following industry procedures.

*Objective 9: The student will inspect a front suspension for wear to verify that it is within manufacturer's specifications.

*Objective 10: The student will inspect a steering system for damaged parts or wear which exceeds manufacturer's specifications.

*Objective 11: The student will remove and replace a tie rod end following industry accepted procedures.

*Objective 12: The student will remove, service, and replace a power steering pump following industry accepted procedures.

*Objective 13: The student will make preliminary checks before wheel alignment following accepted industry practices.

Objective 14: The student will align a front end on a vehicle without a front cap to manufacturer's specifications.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Identified tools used in front end service.
____ 2. Matched correct load range for tires to ply ratings.
____ *3. Gave reasons for periodic tire rotation.
____ 4. Drew tire rotation patterns.
____ *5. Stated conditions which would require rebalancing of wheels.
____ *6. Checked tires and wheel runout.
____ *7. Spun balanced a tire and wheel assembly.
____ *8. Inspected and replaced shock absorbers.
____ *9. Inspected a front suspension for wear.
____ *10. Inspected a steering system for damaged parts or wear.
____ *11. Removed and replaced a tie rod end.
____ *12. Removed, replaced, and serviced a power steering pump.
____ *13. Made preliminary checks before wheel alignment.
____ 14. Aligned a front end on a vehicle without a front cap.

*Indicates core/essential objectives

COURSE: Automotive Mechanics II

Unit 8: Air Conditioning and Heating

Objectives: Upon completion of this unit, the student will:

*1. Identify the components of a refrigeration system.
*2. Identify the high and low sides of a compressor.
*3. List safety rules for auto air conditioning.
*4. Connect a manifold gauge set into an auto air conditioning system.
*5. Purge an auto air conditioning system.
*6. Evacuate a system using a vacuum pump and charging station.
*7. Charge an auto air conditioning system.
*8. Identify the major components of a heater system.
*9. Pressure test a heater.
*10. Back flush a heater core.
*11. Remove and replace a water control valve.
*12. Inspect and test a blower motor.

*Indicates core/essential objectives

Suggested Instructional Procedures:

Lecture-discussion
Laboratory demonstration and practice

Suggested Resources:

Primary Resource: Armstrong, Ivan J. Auto Mechanics, Vol. II. Stillwater, OK: Oklahoma State Board of Vocational and Technical Education. 1978.

Evaluation and Suggested Minimum Performance Standards:

*Objective 1: The student will identify six components of an automotive air conditioning system.
*Objective 2: The student will identify the high and low side of a compressor.
*Objective 3: The student will list seven safety rules associated with auto air conditioning service.
*Objective 4: The student will connect a manifold gauge set to an auto air conditioner following accepted industry practices.
*Objective 5: The student will purge an auto air conditioning system following accepted industry procedures.
*Objective 6: The student will evacuate an auto air conditioning system using a vacuum pump or charging station and following accepted industry practices.
*Objective 7: The student will charge an auto air conditioning system to manufacturer's specifications.

*Objective 8: The student will identify six components of a heater core.
*Objective 9: The student will pressure test a heater to verify that it does not leak at operating system pressure.
*Objective 10: The student will back flush a heater core following accepted industry practices.
*Objective 11: The student will remove and replace a water control valve following accepted industry procedures.
*Objective 12: The student will inspect and test a fan motor for current draw.

*Indicates core/essential objectives

Performance Record: Place a check by each objective the student achieved:

____ *1. Identified the components of a refrigeration system.
____ *2. Identified the high and low sides of a compressor.
____ *3. Listed safety rules for auto air conditioning.
____ *4. Connected a manifold gauge set into an auto air conditioning system.
____ *5. Purged an auto air conditioning system.
____ *6. Evacuated a system using a vacuum pump and charging station.
____ *7. Charged an auto air conditioning system.
____ *8. Identified the major components of a heater system.
____ *9. Pressure tested a heater.
____ *10. Back flushed a heater core.
____ *11. Removed and replaced a water control valve.
____ *12. Inspected and tested a blower motor.

*Indicates core/essential objectives

STUDENT PERFORMANCE RECORD

AUTOMOTIVE MECHANICS

AUTOMOTIVE MECHANICS I

Student: _____

This record is provided as an alternative to the student performance records at the end of each unit. It can be duplicated for each student and serve as a cumulative record of competencies achieved in the course.

Place a check by each objective the student achieved; you may wish to note the date that the student achieved the objective.

C = Core competencies.

____ 1. Described facts concerning the occupational outlook of auto mechanics.
____ 2. Named the steps involved in automotive shop work.
____ 3. Stated reasons for joining the VICA organization.
____ C4. Listed rules for personal safety.
____ C5. Listed rules for general shop safety.
____ C6. Listed safety rules for cold chisels, hammers, pliers, screwdrivers, and vises.
____ C7. Listed safety rules involving the engine.
____ C8. Listed safety rules involving the battery.
____ C9. Listed safety rules involving flammable liquids.
____ C10. Listed safety rules for using the bench grinder, lifting devices, and portable electric drive tools.
____ 11. Matched fire extinguishers to the classes of fire each is best suited to extinguish.
____ 12. Associated the Federal safety colors with their uses.
____ C13. Defined terms associated with hazardous materials.
____ C14. Identified categories of hazardous materials.
____ C15. Stated signal words or symbols that indicate how severe a hazard may be.
____ C16. Listed methods for reducing hazardous waste.
____ C17. Identified general procedures for storing hazardous materials and wastes.
____ C18. Identified and described the informational sections found on a Material Safety Data Sheet.
____ C19. Described general first aid procedures to follow in case of an accident involving hazardous materials.
____ C20. Identified safety equipment to be used with hazardous materials.
____ C21. Listed steps to follow in handling spills and waste disposal.
____ C22. Identified agencies to be contacted in case of an accident or for more information on hazardous materials.
____ C23. Identified the different types of the following general-use hand tools: screwdrivers, pliers, wrenches, sockets and accessories, hammers, punches and chisels, and files.
____ 24. Identified different types of parts cleaning tools.
____ C25. Identified types of general shop tools.

____ 26. Sharpened a twist drill bit.
____ 27. Reshaped a cold chisel.
____ 28. Dressed a grinding wheel.
____ 29. Fitted a screwdriver.
____ 30. Checked a torque wrench for accuracy.
____ 31. Identified common types of rules.
____ 32. Described the uses of rules with accessories.
____ 33. Listed general procedures for using rules.
____ 34. Identified common units of measurement found on rules.
____ 35. Identified the common types of micrometers.
____ 36. Read a measurement using a pocket rule.
____ C37. Read a measurement using an outside micrometer.
____ 38. Named the types and forms of energy.
____ C39. Described the operation of a four-stroke cycle engine.
____ C40. Identified the common parts of a water-based cooling system and described their functions.
____ 41. Identified tools used for cooling system service.
____ C42. Pressure tested, inspected, and repaired a water-based cooling system.
____ C43. Identified components of the engine lubrication system and their purposes.
____ C44. Identified tools used for lubrication service.
____ 45. Identified types of oil filters.
____ 46. Named additives commonly used in engine oil and stated their purposes.
____ 47. Described the classification systems for engine oils.
____ C48. Changed the oil and filter of an engine.
____ C49. Identified tools used for exhaust system service.
____ 50. Described the operation and construction of a catalytic converter.
____ C51. Removed and replaced components of the exhaust system.
____ 52. Described electricity according to the electron theory.
____ C53. Defined voltage, amperage, and ohms in relation to current flow.
____ C54. Demonstrated the ability to use a VOM meter to determine voltage and resistance.
____ C55. Identified tools used in battery service.
____ 56. Stated the purpose of the major parts of a battery.
____ C57. Listed safety rules to be observed during care and maintenance of batteries.
____ C58. Removed, cleaned and serviced, and replaced a battery.
____ C59. Load tested a battery.
____ C60. Charge tested a battery.
____ C61. Identified tools used for starter service.
____ C62. Described the operating principle of a starter.
____ C63. Listed the components of a starting system and the purpose of each.
____ C64. Identified the parts of a starter.
____ C65. Load tested a starter.
____ C66. Tested starter circuit resistance.
____ C67. Tested starter control circuit resistance.
____ C68. Removed and replaced a starter.

____ C69. Disassembled, checked, and reassembled a starter.
____ C70. Identified tools used for charging system service.
____ C71. Stated the purposes of the major components of a charging system.
____ C72. Identified the parts of an alternator.
____ 73. Described the construction of a stator.
____ C74. Described current and voltage regulation in an alternator.
____ 75. Identified the types of voltage regulators for alternators.
____ C76. Removed and replaced an alternator.
____ C77. Disassembled, checked, and reassembled an alternator.
____ C78. Tested current output of an alternator.
____ C79. Tested external type voltage regulator.
____ C80. Tested internal type voltage regulator.
____ C81. Stated the purpose of the ignition system.
____ C82. Identified tools used for ignition system service.
____ C83. Identified the major components of an ignition system and stated the purpose of each.
____ C84. Distinguished between components of the primary and secondary ignition systems.
____ C85. Identified spark plugs according to heat range.
____ C86. Matched causes to spark plug conditions.
____ C87. Removed, serviced, and replaced sparkplugs.
____ C88. Checked and set ignition timing.
____ C89. Identified common electrical symbols used in chassis wiring diagrams.
____ C90. Identified instruments used in testing automobile electrical circuits.
____ C91. Listed characteristics of a wiring diagram.
____ C92. Read a wiring diagram.
____ C93. Troubleshot an electrical circuit.
____ C94. Identified tools used for fuel system service.
____ C95. Listed the purpose of each component of a typical carburetor-type gasoline fuel system.
____ 96. Described the operation of a mechanical fuel pump.
____ C97. Identified parts of a carburetor.
____ C98. Stated the difference in a fuel injection system and a carburetor-type system.
____ C99. Tested a fuel pump for volume and pressure.
____ C100. Removed and replaced a fuel pump.
____ C101. Serviced an air cleaner.
____ C102. Removed and replaced a carburetor.
____ C103. Disassembled and replaced a carburetor.
____ C104. Described the areas of automotive emission controls.
____ 105. Named the major classes of emission pollutants.
____ C106. Stated three possible causes of the emission of unburned hydrocarbons.
____ 107. Stated the major cause of carbon monoxide emissions.
____ 108. Stated three factors that can affect the emission of $NO_x$.
____ 109. Stated the purpose of the heated air induction system.
____ 110. Stated the purpose of the evaporative emissions control system.
____ 111. Stated the purpose of the exhaust crossover system.

____C112. Stated the purpose of the exhaust gas recirculation system.
____C113. Stated the purpose of the positive crankcase ventilation system.
____ 114. Stated the purpose of the air injection system.

AUTOMOTIVE MECHANICS II

Student: _____

This record is provided as an alternative to the student performance records at the end of each unit. It can be duplicated for each student and serve as a cumulative record of competencies achieved in the course.

Place a check by each objective the student achieved; you may wish to note the date that the student achieved the objective.

C = Core competencies.

____ 1. Described facts concerning the occupational outlook of auto mechanics.
____ 2. Named the steps involved in automotive shop work.
____ 3. Stated reasons for joining the VICA organization.
____ C4. Listed rules for personal safety.
____ C5. Listed rules for general shop safety.
____ C6. Listed safety rules for cold chisels, hammers, pliers, screwdrivers, and vises.
____ C7. Listed safety rules involving the engine.
____ C8. Listed safety rules involving the battery.
____ C9. Listed safety rules involving flammable liquids.
____ C10. Listed safety rules for using the bench grinder, lifting devices, and portable electric drive tools.
____ 11. Matched fire extinguishers to the classes of fire each is best suited to extinguish.
____ 12. Associated the Federal safety colors with their uses.
____ C13. Defined terms associated with hazardous materials.
____ C14. Identified categories of hazardous materials.
____ C15. Stated signal words or symbols that indicate how severe a hazard may be.
____ C16. Listed methods for reducing hazardous waste.
____ C17. Identified general procedures for storing hazardous materials and wastes.
____ C18. Identified and described the informational sections found on a Material Safety Data Sheet.
____ C19. Described general first aid procedures to follow in case of an accident involving hazardous materials.
____ C20. Identified safety equipment to be used with hazardous materials.
____ C21. Listed steps to follow in handling spills and waste disposal.
____ C22. Identified agencies to be contacted in case of an accident or for more information on hazardous materials.
____ 23. Identified common types of rules.
____ 24. Described the uses of rules with accessories.
____ 25. Listed general procedures for using rules.
____ 26. Identified common units of measurement found on rules.
____ 27. Identified the common types of micrometers.

____ 28. Read a measurement using a pocket rule.
____ C29. Read a measurement using an outside micrometer.
____ C30. Identified tools used in engine repair.
____ C31. Identified conditions that cause low oil pressure in engines.
____ C32. Identified conditions that cause oil consumption in engines.
____ C33. Named items to check prior to testing for internal engine noise.
____ C34. Tested engine compression.
____ C35. Listed safety precautions to observe while removing an engine.
____ C36. Removed an engine.
____ C37. Listed safety precautions to observe while disassembling an engine.
____ C38. Cleaned and disassembled an engine.
____ C39. Stated the purpose of a valve train.
____ C40. Identified the parts of a valve train.
____ C41. Inspected timing gears and timing chain.
____ C42. Inspected camshaft.
____ C43. Disassembled, cleaned, and inspected a cylinder head assembly.
____ C44. Reconditioned a cylinder head.
____ C45. Identified the parts of a crankshaft.
____ C46. Distinguished between bearing spread and bearing crush.
____ C47. Distinguished between the purpose of the torsional vibration damper and flywheel.
____ C48. Listed conditions which cause low oil pressure.
____ C49. Measured and inspected a crankshaft.
____ C50. Fitted a crankshaft bearing with plastigage.
____ C51. Installed a rear main bearing seal (crankshaft removed).
____ C52. Named types of cylinder block core plug holes.
____ C53. Identified parts of piston and connecting rod assembly.
____ C54. Associated compression rings with their proper method of installation.
____ C55. Listed methods for installing oil rings.
____ C56. Matched piston conditions to their correct causes.
____ 57. Identified different types of piston pin locks.
____ C58. Removed piston ridge from cylinder.
____ C59. Measured a cylinder.
____ C60. Honed a cylinder.
____ C61. Cleaned a cylinder head surface and checked for warpage.
____ C62. Listed reasons for torquing bolts to specifications.
____ C63. Installed crankshaft, bearings, timing gears, and timing cover.
____ C64. Installed pistons and connecting rod assemblies.
____ C65. Installed oil pump, pickup screen, and oil pan.
____ C66. Installed cylinder head, intake manifold, and exhaust manifold.
____ C67. Installed engine accessory components.
____ C68. Listed safety precautions to observe when installing an engine.

____ C69. Listed items to check or adjust before starting a new or rebuilt engine.
____ C70. Installed an engine.
____ C71. Adjusted and started a newly installed engine.
____ C72. Discussed the relationship of a conventional ignition to an electronic ignition system.
____ C73. Listed advantages of the electronic ignition system.
____ C74. Identified the major components of an electronic ignition system.
____ C75. Stated the function of each of the major components of an electronic ignition system.
____ C76. Listed components of an electronically controlled engine system and stated one function of each component.
____ C77. Listed processes performed by the processor unit of an electronic control module.
____ C78. Listed processes performed by the calibration unit of an electronic control module.
____ C79. Described the operation of an electronically controlled engine system.
____ C80. Identified tools used in drive line repair.
____ C81. Identified the components of a clutch assembly.
____ C82. Discussed clutch operation.
____ C83. Adjusted clutch linkage free travel.
____ C84. Identified the major parts of a transmission.
____ 85. Identified the parts of a synchronizer.
____ C86. Discussed the operation of a three-speed synchromesh transmission.
____ 87. Identified the components of an electronically operated overdrive.
____ C88. Removed and replaced a standard transmission and clutch assembly.
____ C89. Identified the types of drive lines.
____ 90. Identified the types of U-joints.
____ C91. Removed and replaced a propeller shaft.
____ C92. Removed and replaced a U-joint.
____ 93. Listed repairs which can be performed on an automatic transmission with the transmission in the vehicle.
____ C94. Listed the steps in checking automatic transmission fluid.
____ C95. Matched automatic transmission fluid conditions to their possible causes.
____ C96. Tuned up an automatic transmission.
____ C97. Removed and replaced an automatic transmission.
____ C98. Identified tools used in brake system service.
____ C99. Identified components of the tandem or dual brake system.
____C100. Described the operation of the brake system.
____C101. Adjusted brake shoes.
____C102. Bled a brake system.
____C103. Removed, inspected, and replaced brake drums.
____C104. Removed and replaced brake shoes.
____C105. Removed and replaced a wheel cylinder.
____C106. Removed and replaced a tandem master cylinder.

____C107. Stated the functions of major components of disc brake systems.
____C108. Tested hydraulic systems.
____C109. Tested vacuum power booster.
____C110. Repaired a sliding caliper disc brake.
____C111. Checked disc runout and thickness.
____C112. Turned a rotor.
____C113. Cleaned and inspected a bearing.
____C114. Adjusted front wheel bearings.
____C115. Packed a front wheel bearing assembly.
____C116. Identified tools used in front end service.
____ 117. Matched correct load range for tires to ply ratings.
____C118. Gave reasons for periodic tire rotation.
____ 119. Drew tire rotation patterns.
____C120. Stated conditions which would require rebalancing of wheels.
____C121. Checked tires and wheel runout.
____C122. Spun balanced a tire and wheel assembly.
____C123. Inspected and replaced shock absorbers.
____C124. Inspected a front suspension for wear.
____C125. Inspected a steering system for damaged parts or wear.
____C126. Removed and replaced a tie rod end.
____C127. Removed, replaced, and serviced a power steering pump.
____C128. Made preliminary checks before wheel alignment.
____ 129. Aligned a front end on a vehicle without a front cap.
____C130. Identified the components of a refrigeration system.
____C131. Identified the high and low sides of a compressor.
____C132. Listed safety rules for auto air conditioning.
____C133. Connected a manifold gauge set into an auto air conditioning system.
____C134. Purged an auto air conditioning system.
____C135. Evacuated a system using a vacuum pump and charging station.
____C136. Charged an auto air conditioning system.
____C137. Identified the major components of a heater system.
____C138. Pressure tested a heater.
____C139. Back flushed a heater core.
____C140. Removed and replaced a water control valve.
____C141. Inspected and tested a blower motor.